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DIABETES SURVEILLANCE: DIABETES HOSPITALIZATIONS IN NORTH CAROLINA

by
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ABSTRACT

The State Center for Health and Environmental Statistics has long recognized the important contribution of diabetes mellitus to mortality and morbidity in North Carolina. To address this concern, a statewide surveillance system for diabetes-related mortality and morbidity has been instituted with funding from the Centers for Disease Control. Earlier diabetes surveillance results found significant increases in the number of deaths and in crude and age-adjusted mortality rates from 1980 through 1989. The purpose of the present study is to describe resident diabetes-related hospitalizations and attempt to explain variations by demographic variables.

Using data submitted by hospitals to the North Carolina Medical Database Commission, the rates of diabetes-related discharges for 1988 and 1989 were found to vary by age, sex, and county. Both the numbers and rates of hospitalization increased with increasing age, reflecting both the increasing prevalence of diabetes and the more frequent occurrence of complications as people age. Total and average charges per hospital stay were also higher for groups over the age of 40 than for those under.

Hospitalizations for diabetes-related conditions involved more females than males. Generally, crude hospitalization rates, total and average length of stay, and total charges were higher for females than for males. However, the average charge per stay was higher for males than for females in all age groups above one year.

The pattern of diabetes-related hospital discharge rates by county is similar to that described in an earlier CHES Studies report focusing on diabetes mortality (No.61). That is, elevated rates cluster geographically throughout the east, and to a much lesser extent in the west.

INTRODUCTION

A grant award from the Centers for Disease Control has enabled the State Center for Health and Environmental Statistics (SCHES) to establish a surveillance system for diabetes-related mortality and morbidity in North Carolina. Mortality surveillance revealed significant increases in the number of diabetes-related deaths and in crude and age-adjusted mortality rates in North Carolina from 1980 through 1989.[1] North Carolina also had the 16th highest state ranking in age/race-adjusted diabetes-related mortality for the period 1980 through 1986.[2]

While mortality analysis is an important component of diabetes surveillance, it does not suffice to examine only deaths when monitoring a chronic disease. Rather, an ideal surveillance system is one which could estimate prevalence (the number of individuals with diabetes existing in the population at any given time), incidence (the number of individuals with initial disease occurrence), medical complications among the diseased, and the diabetic's utilization of health care resources.

Unfortunately, most of these data are very difficult to obtain without primary data collection, which can be prohibitively expensive. However, some health researchers are now using health insurance claims for hospitalizations as a rough proxy for measuring the societal burden of chronic disease. Claims data have "advanced research on patient utilization of health services, small area variations in health service use, patient outcomes, and the occurrence and appropriateness of various treatment approaches for certain health problems".[3] Researchers have reported claims data to be "generally complete, and when appropriately used, highly reliable".[4] Hospital discharge data from claims forms can also provide estimates of health care costs associated with the most acute manifestations of diabetes.

Hospital discharge data are better indicators of diabetes prevalence and diabetes-related medical complications than mortality data, if for no other reason than because of the greater number of persons hospitalized. However, there are still many diabetics who will never be hospitalized or even diagnosed with the disease. Studies indicate that for every person diagnosed with diabetes, another person remains undiagnosed.[5] Many of the most common complications of diabetes, such as chronic heart, circulatory, and kidney disease, are therefore never attributed to diabetes.

The purpose of the present study is to describe resident diabetes-related hospitalizations and attempt to explain variations by demographic variables.

DATA AND METHODS

The North Carolina Medical Database Commission (MDC) has established a population-based inpatient health care information system as partial fulfillment of their legislative mandate. The Commission uses the UB-82 medical claims form to collect data regarding insurance provider, patient and hospital identification, age and sex of patient, total charges, principal and other diagnoses (up to a total of five), and principal and other procedures (up to a total of three), etc. This database includes information pertaining to civilian hospital inpatient services only. It does not include information about hospital emergency room or other outpatient services, nor does it contain information about military hospitalizations. Neither is information pertaining to the patient's race available in this database.

The numbers and rates of hospital discharges by age, sex, and county presented in this report use summarized MDC hospitalization information for calendar years 1988 and 1989. Hospitalizations with diabetes listed as the primary diagnosis or as any of five diagnoses are examined. However, in the interest of more accurately representing the total burden of diabetes care, emphasis will be on hospitalizations for which diabetes was one of the five diagnoses listed at discharge. Hospital records for individuals with gestational diabetes were not included in this dataset, but are examined in an earlier *CHES Studies* report (No. 64), "Diabetes in Pregnancy in North Carolina."

The data files received from the MDC were not unduplicated; that is, a person who was hospitalized for diabetes twice in one year was counted as two diabetes-related discharges that year. For this reason, high hospitalization rates are difficult to interpret.

For example, a high hospitalization rate in a particular county could mean that diabetes is highly prevalent in that county and has resulted in many diabetes-related hospitalizations. Or a high rate could mean that a relatively small number of the population are affected, but that they are repeatedly hospitalized for serious diabetes-related complications. Either interpretation (or a combination of both), however, would seem to indicate a diabetes-related health problem. The reader should also keep in mind that county-specific hospitalization rates may be more reflective of the overall level of hospital services available to diabetics in a particular county than of the actual magnitude of the diabetes problem in that county.

While the use of this type of data does pose some limitations in interpretation, it is still useful to estimate the impact of diabetes on overall health care utilization. Hospitalizations are also clearly a major part of the total cost of diabetes.

North Carolina population estimates for July 1 were used to calculate crude hospitalization rates in the general population during 1988 and 1989. Age-adjusted mortality rates in the general population were calculated using the direct method[6] and the 1980 population of North Carolina as the standard.

The diabetes-related crude and age-adjusted hospitalization rates in the general population have been mapped by county in Figures 11 and 12, respectively. Here, rates were categorized into five levels, from highest (depicted in solid black) to lowest (solid white). To assign the ranges for these levels, a SAS clustering routine was used to group counties "most like each other" with respect to their crude and their age-adjusted rates. Depending upon the degree and direction with which county rates differ from one another, the results may yield widely varying numbers of counties per level.

RESULTS

Numbers

Diabetes was a mentioned diagnosis for seven percent of all hospital stays in 1988 and 1989. The total number of hospitalizations with at least one diabetes diagnosis mentioned at discharge was 58,712 in 1988, rising seven percent to 62,952 in 1989 (Table 1). During the two-year period, nearly 59 percent of the total number were females. The number of diabetes-diagnosed hospitalizations increased dramatically with age: only 20 infants were hospitalized with diabetes before their first birthday, while other hospitalizations included 2,371 between the ages of 1 and 19; 10,257 aged 20 to 39; and 48,025 aged 40 to 64. The numbers by age and sex are depicted in Figure 1.

As a primary diagnosis, diabetes was responsible for only 18,791 hospitalizations during 1988-89 (Table 2). Thus, diabetes was mentioned at discharge over six times as often as it was listed as the primary diagnosis. Figure 2 depicts these relationships by age. For those 0 to 39 years of age, diabetes was a mentioned diagnosis only times as often as it was a primary. For those 40 and older, however, diabetes was mentioned at discharge nearly eight times as often as it was listed as the primary diagnosis.

The 4th digit of ICD-9 code 250 denotes diabetes-related complications. The majority of diabetes-related hospitalizations had no mention of complication (250.0). Diabetes with unspecified complication (250.9) was the second most frequently cited fourth-digit designation. Diabetes with neurological manifestations (250.6) was coded nearly 7,000 times between 1988 and 1989. Nearly 6,000 discharges cited diabetes with renal manifestations (250.4). Diabetes with ketoacidosis (250.1) was mentioned at discharge 5,375 times. Ophthalmic manifestations (250.5) were mentioned nearly 4,700 times. Peripheral circulatory disorders (250.7) was the only complication to have resulted in the hospitalization of a greater number of males than females (1,623 and 1,612 respectively). Diabetes with hyperosmolar coma (250.2) and with other coma (250.3) played a role in nearly 900 hospitalizations across North Carolina in two years. Figure 3 depicts hospitalizations involving major diabetes complications for males and females.

The fifth digit of ICD-9 code 250 distinguishes between juvenile-type and adult-onset/unspecified-type. Using primary diagnosis at discharge, 73 percent of the 18,791 diabetes diagnoses specified juvenile-type. The percentage was identical for males and females as shown in Figure 4.

The total length of stay for diabetes-related hospitalizations increases markedly after the age of 40 for both sexes (Figure 5). On average, females were hospitalized for diabetes-related causes 55 percent more total days than males, and the difference between the sexes in total days increased with increasing age. For example, in the age group 75+, females spent over twice as long as diabetes inpatients as did males.

The average length of stay also increased with advancing age, from 5.3 days for ages 1-19 to 10.5 days for those 75+ (Table 1). Not only were more females than males hospitalized annually, but their average length of stay was longer as well — 9.1 days per diabetes-related discharge for females compared to 8.3 for males (Table 1). The average days of stay for age-sex groups are depicted in Figure 6.

As one would expect, total diabetes-related inpatient charges (Figure 7) are highly dependent upon the total length of stay (Figure 5). As such, their age/sex distributions are very similar. However, while the total and average length of stay and the total inpatient charges were generally higher for females of every age group, the average charges per stay were consistently higher for males than for females (Figure 8). One explanation may be that males tend to experience more costly complications than females. For example, males were found to have markedly higher rates of diabetes with peripheral circulatory disorders than females (see Figure 10).

Rates

During 1988-89, there were 106 female diabetes-related hospitalizations per 10,000 female population, compared to 80 per 10,000 males (Table 1). However, the gender disparity did not exist for every age group (Figure 9). Among persons 75+, the discharge rate for males (420.0 per 10,000) was slightly higher than that for females (417.4). Differences in population-based rates such as these are most likely due to differences by age and sex in the prevalence of diabetes, the severity of the disease, and the availability and use of health care.

Sex-specific hospital discharge rates for major diabetes-related complications are depicted in Figure 10. Diabetes with peripheral circulatory disorders (250.7) and diabetes with other specified manifestations (250.8) were the only complications for which discharge rates for males were higher than those for females. Diabetes without mention of complication (250.0) and diabetes with unspecified condition (250.9) were the most frequently reported 4-digit codes.

GEOGRAPHIC PATTERNS OF DIABETES-RELATED HOSPITALIZATIONS

Table 3 shows crude and age-adjusted diabetes-related hospitalization rates by county and sex. County rates are also mapped in Figures 11 and 12. As seen in Figure 11, high crude rates were primarily scattered throughout the east, as well as in several of the counties to the far west.

After age-adjusting, the clustering of high rates throughout the east became even more pronounced (Figure 12). As one might expect, these mapping results for diabetes hospitalizations are very similar to those obtained when age-adjusted diabetes-related mortality rates were mapped.[1]

Ideally, one would like to also adjust for race and/or income to be certain that the geographical differences in rates are not primarily due to sociodemographics. Black males and black females have higher prevalence rates of diabetes than white males and white females.[2] Also, low income is associated with the poor dietary and nutritional habits that are important risk factors for developing diabetes. Unfortunately, however, the MDC does not include the race or income variables on its records.

DISCUSSION

Spells of illness frequently culminate in hospital stays for the chronically ill. Persons with diabetes are particularly at high risk for hospitalization, as the disease is associated with severe neurological, cardiovascular, ocular, and renal complications. While studies suggest that diabetes-related complications can be prevented with good control of blood glucose levels, many diabetics are hospitalized each year. Therefore, information on diagnoses, procedures, and the length of hospital stay are important to diabetes surveillance, and treated as indicators of disease burden for monitoring purposes.

Using data submitted by hospitals to the MDC, the number and rate of diabetes-related hospitalizations were found to vary by age, sex, and county. Both the number and the rate increased with increasing age, reflecting both the increasing prevalence of diabetes[2] and the more frequent occurrence of complications as people age. Total and average charges per hospital stay were also higher for groups over the age of 40 than for those under.

Hospitalizations for diabetes-related conditions involved more females than males. Generally, crude hospitalization rates and total and average length of stay were also higher for females than males. However, the average cost per stay was higher for males. One explanation for this phenomenon may be that males tend to experience more costly complications than females.

The pattern of diabetes-related hospital discharge rates by county is similar to that reported in an earlier study of diabetes mortality in North Carolina.[1] That is, elevated rates cluster geographically throughout the east, and to a much lesser extent in the west. However, the MDC data does not include race as a variable in its files so that the county rates were merely adjusted for age. As the prevalence of diabetes also varies significantly by race, a more accurate representation of hospital discharge rates by region would require adjustments for both age and race.

The MDC data file has been useful to diabetes surveillance in describing patient utilization of hospitals by age, sex, and county. It has also provided the first diabetes-related cost information for North Carolina. However, that the file was available to SCHES only in summary form greatly limited the analysis of diabetes-related hospitalizations. Analyses of the relationships among diagnoses and treatment would require use of the individual UB-82 claims records. For example, the summary datafile would not allow for detail regarding persons with diabetes receiving non-traumatic amputations. The complete data file also includes information about pay status, as well as hospital level. Future monitoring of hospital discharges must be based on complete information, rather than summary files if it is to be of maximum value to diabetes surveillance and for describing the full burden of diabetes-related hospitalizations.

ADDENDUM

The general statute applicable to the MDC has very recently been amended to allow the State Health Director access to individual records. This amendment will allow the SCHES greater access to hospitalization information for future approved projects.

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3. Roos LL, Sharp SM, Cohen MM. Comparing Clinical Information with Claims Data: Some Similarities and Differences. *Journal of Clinical Epidemiology*. 1991;44:881.

4. Roos LL, Cageorge SM, Austen E, et al. Using Computers to Identify Complications After Surgery. *American Journal of Public Health*. 1985;75:1288.

5. Kovar MG, Harris MI, Hadden WC. The Scope of Diabetes in the United States Population. *American Journal of Public Health*. 1987:1549.

6. North Carolina Department of Human Resources, State Center for Health Statistics. Adjusted Rates. *Statistical Primer*. Vol. 1, No. 1.

Figure 1. Number of Diabetes-Related Hospitalizations by Age Group and Sex
North Carolina, 1988-89

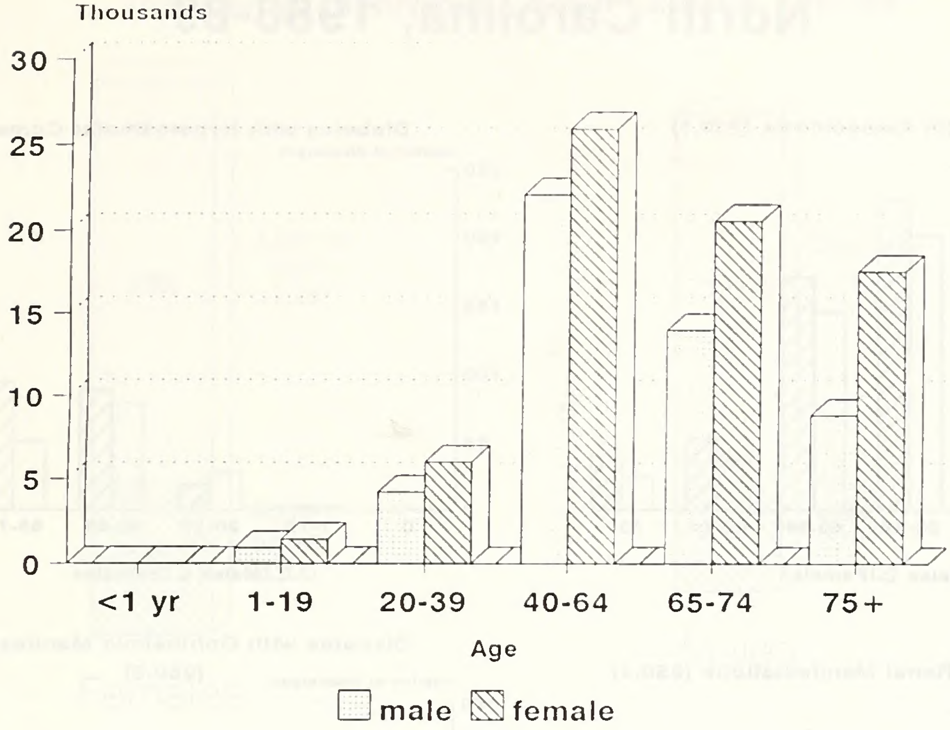


Figure 2. Number of Primary and Diabetes-Related Hospitalizations by Age Group
North Carolina, 1988-89

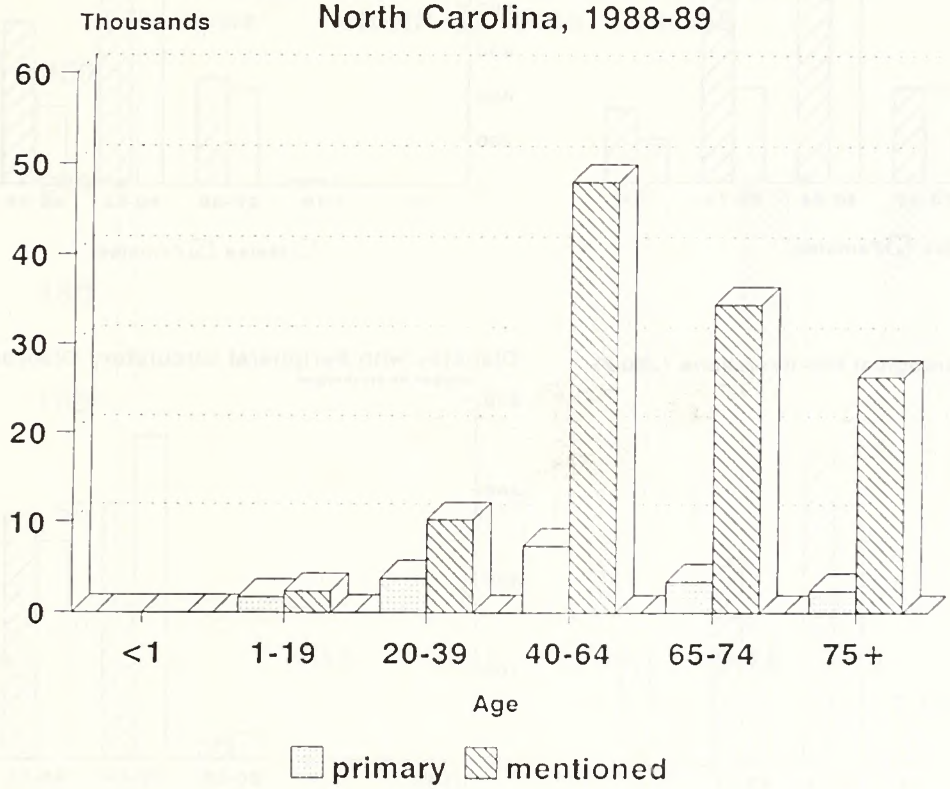
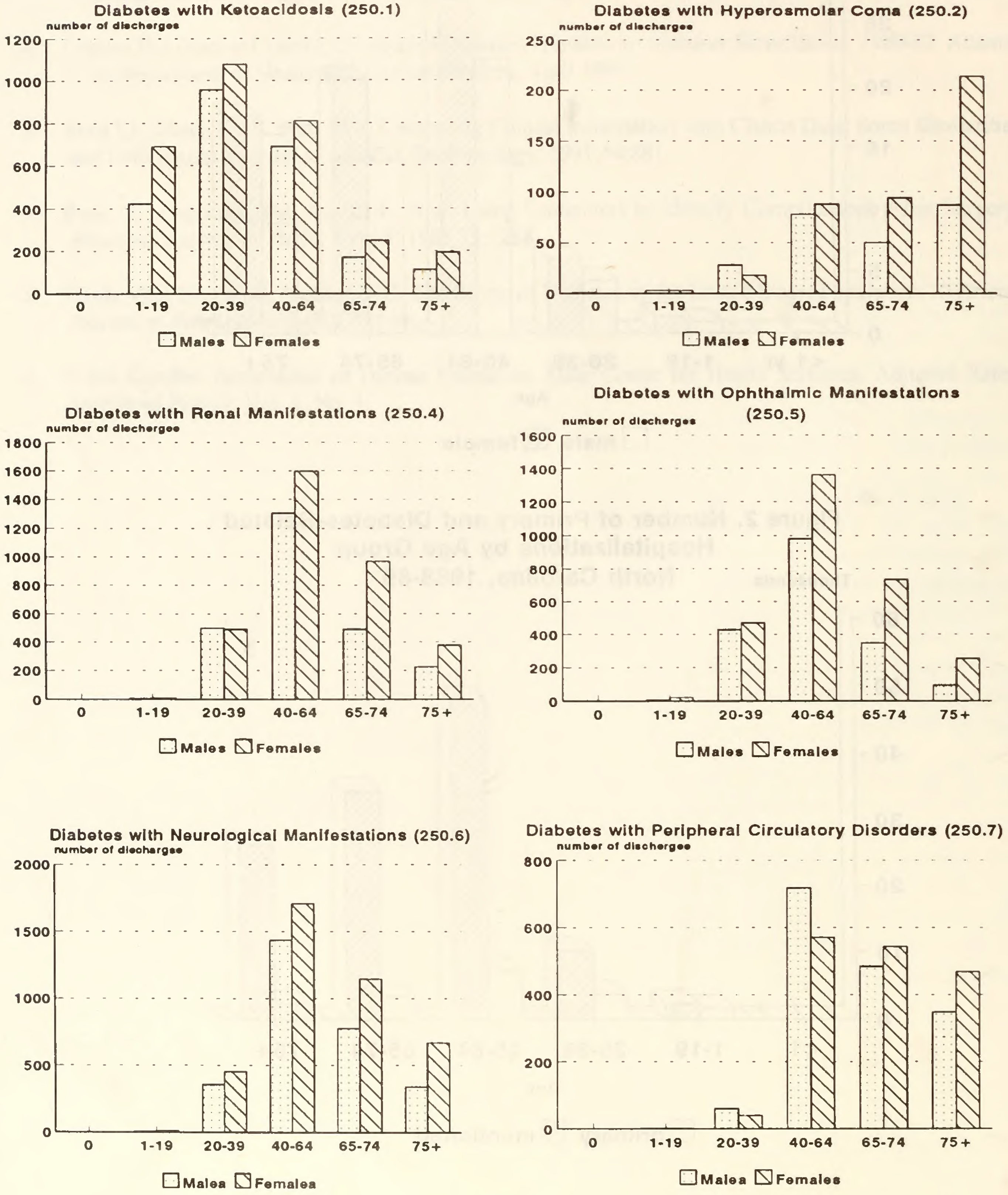


Figure 3. Number of Age/Sex-Specific Diabetes-Related Hospitalizations by Complication North Carolina, 1988-89



Diabetes with Ketoacidosis (250.1)

Diabetes with Hyperosmolar Coma (250.2)

Diabetes with Renal Manifestations (250.4)

Diabetes with Ophthalmic Manifestations (250.5)

Diabetes with Neurological Manifestations (250.6)

Diabetes with Peripheral Circulatory Disorders (250.7)

Figure 4. Sex-Specific Numbers and Percentage Distributions of Hospitalizations with a Primary Diabetes Diagnosis by Type (Adult-onset or Juvenile), North Carolina, 1988-89

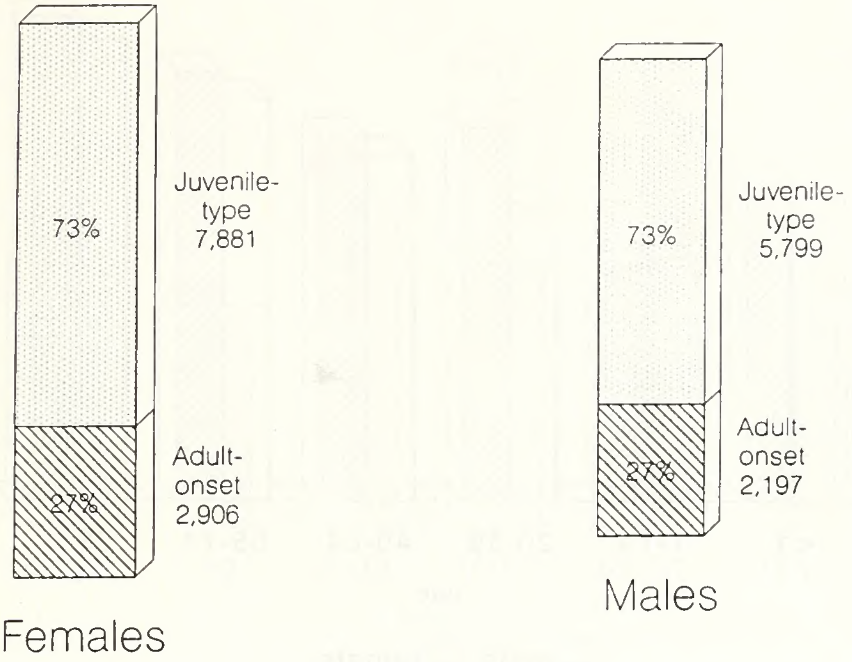
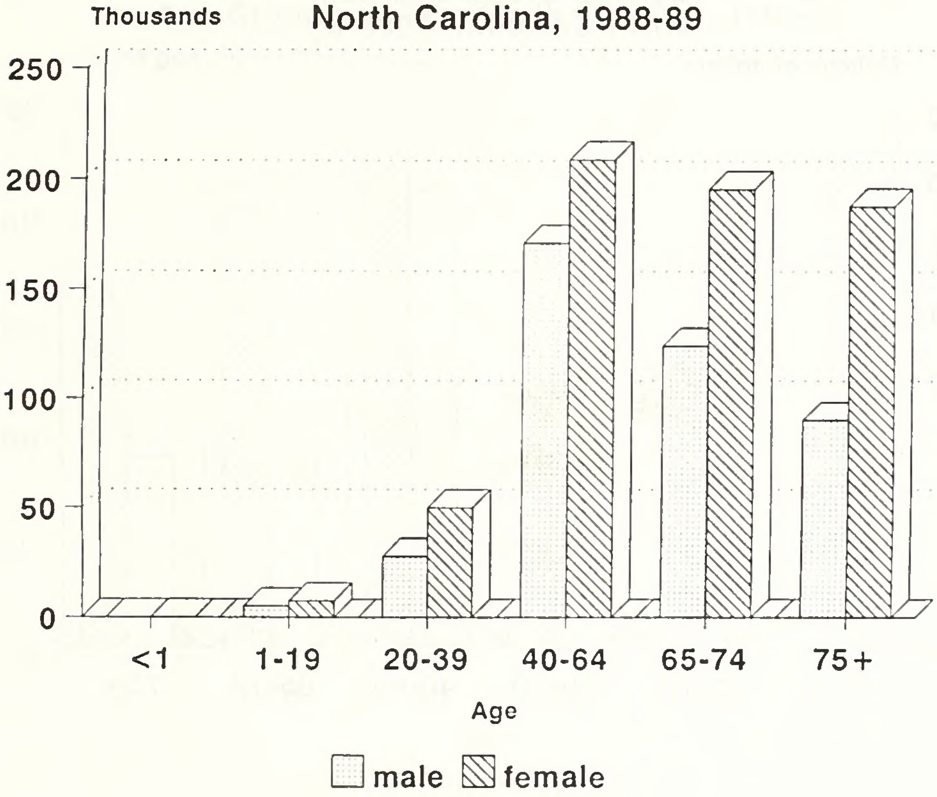


Figure 5. Total Days of Hospital Stay for Diabetes-Related Conditions, by Age Group and Sex North Carolina, 1988-89



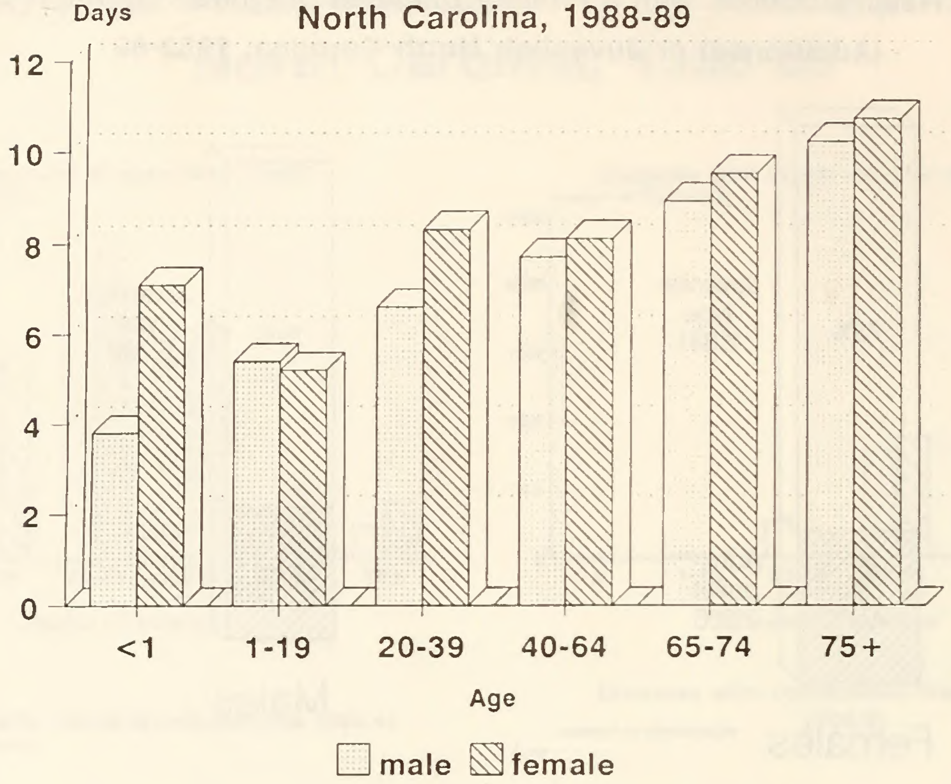


Figure 6. Average Days of Hosptial Stay for Diabetes-Related Conditions, by Age Group and Sex
North Carolina, 1988-89

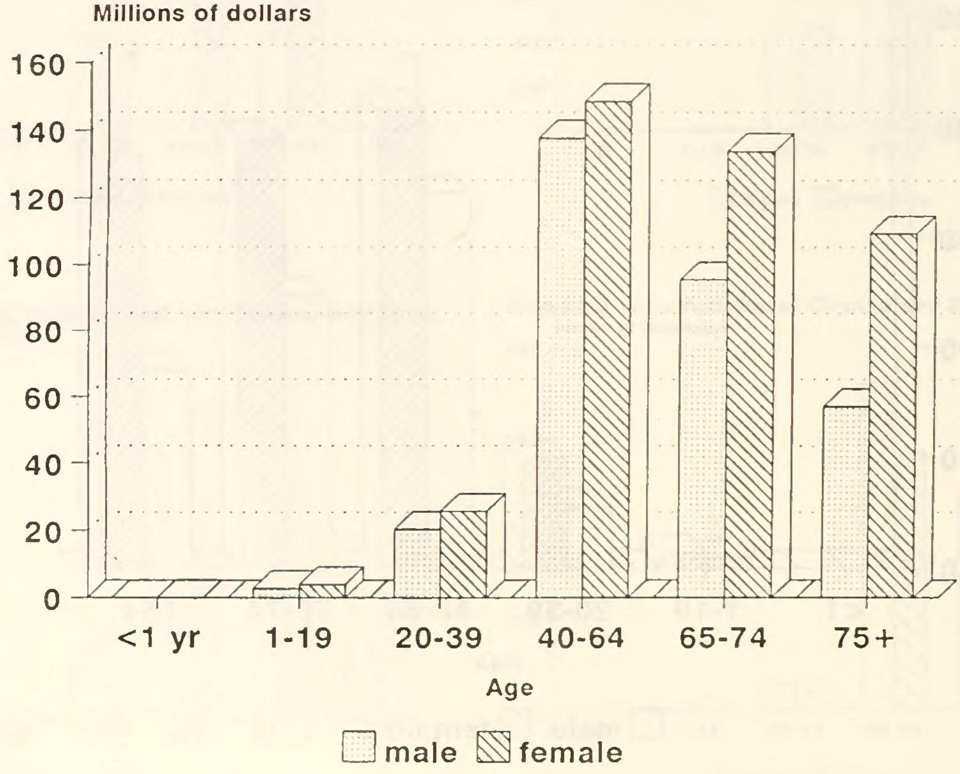


Figure 7. Total Charges for Diabetes-Related Hospitalizations by Age Group and Sex
North Carolina, 1988-89

Figure 8. Average Charges for Diabetes-Related Hospitalizations by Age Group and Sex North Carolina, 1988-89

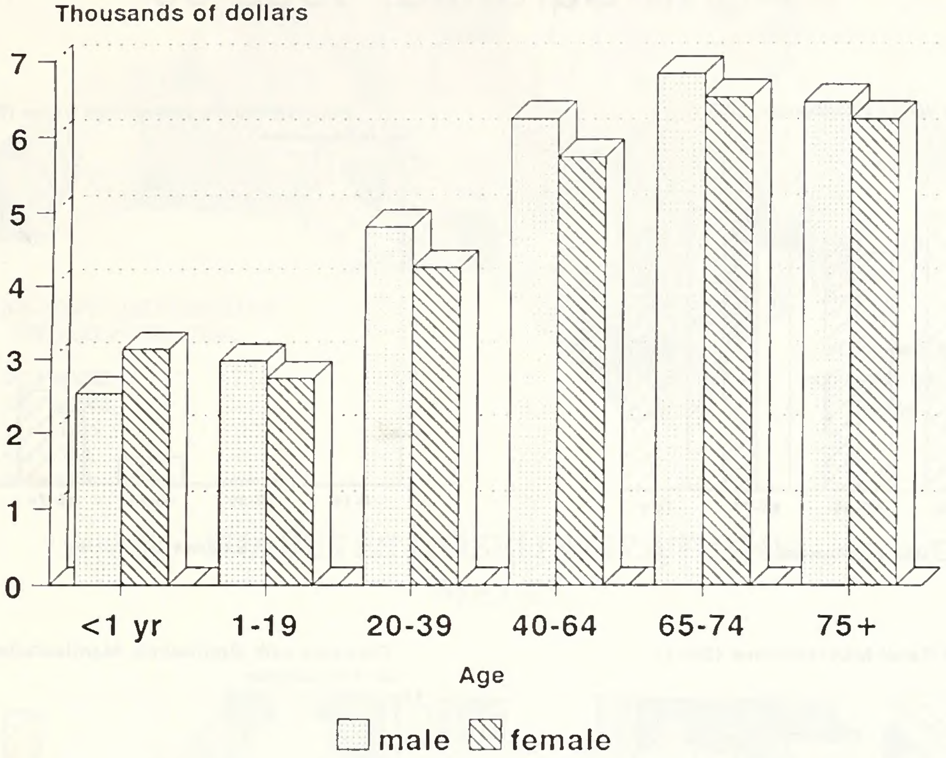


Figure 9. Diabetes-Related Hospitalization Rates by Age Group and Sex, North Carolina, 1988-89

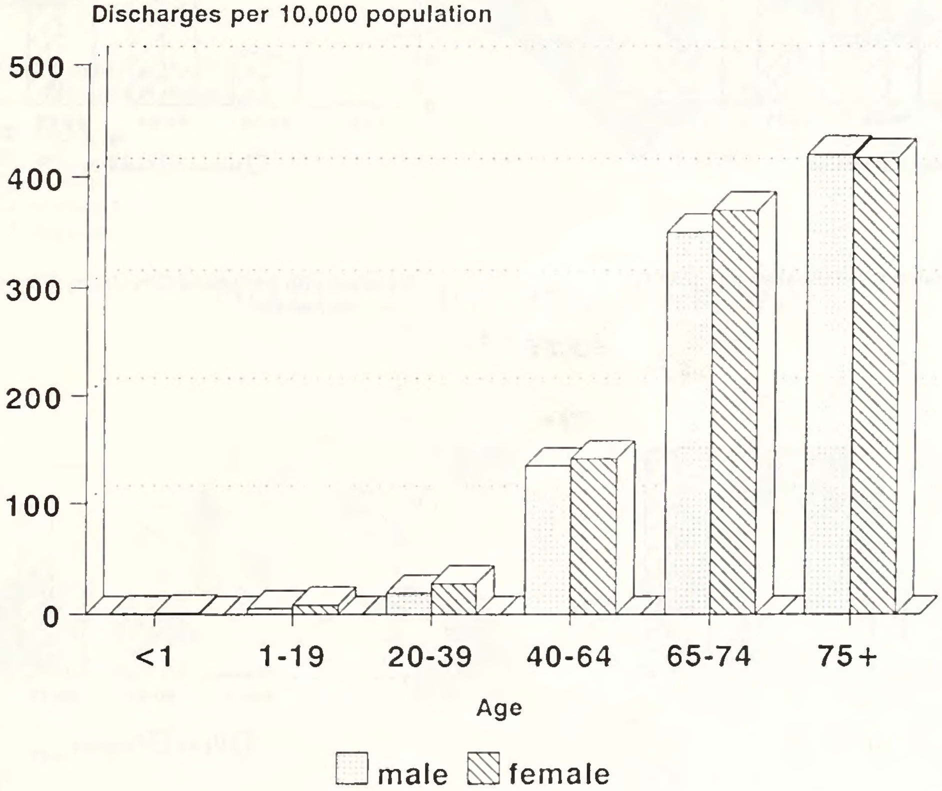
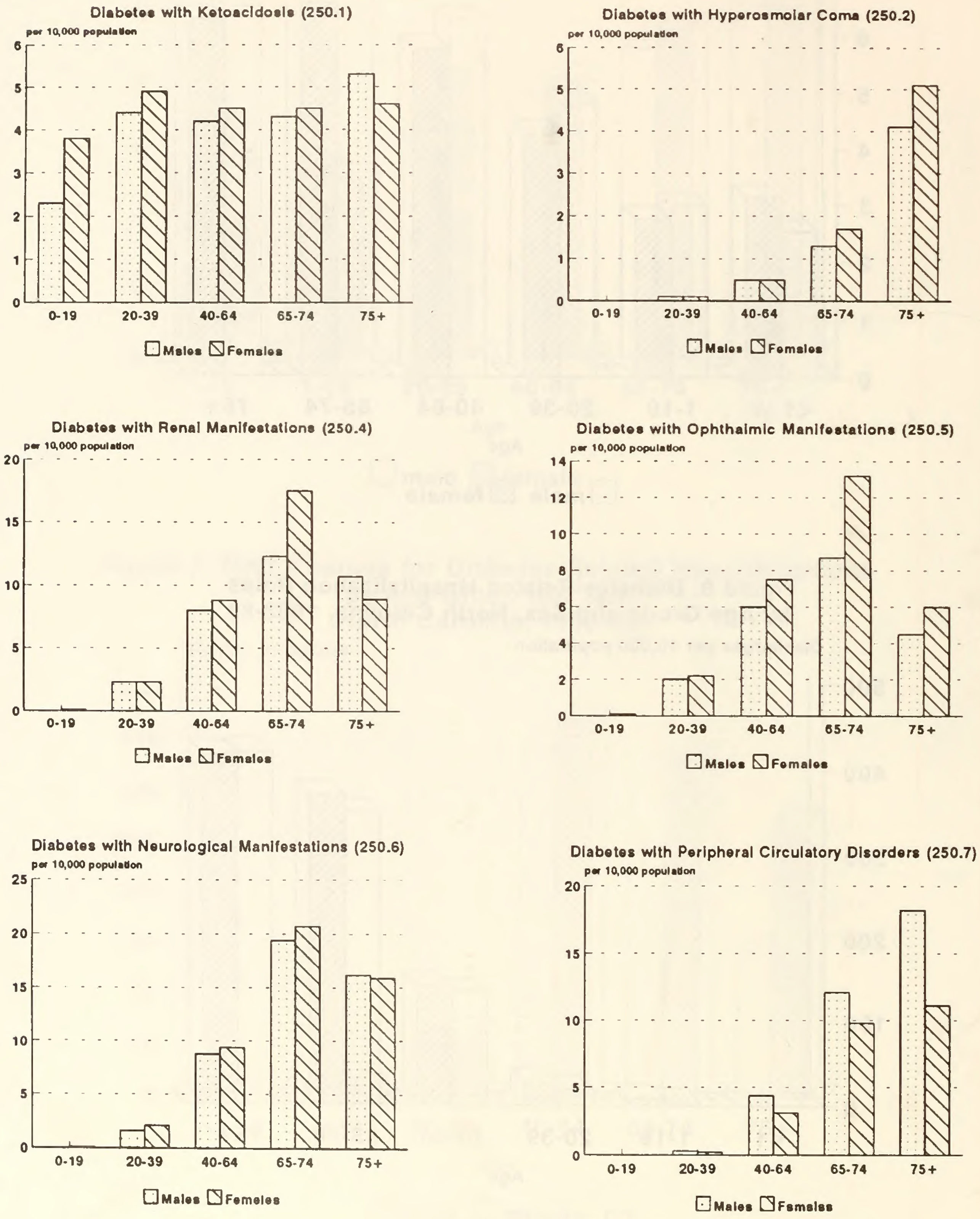


Figure 10. Age/Sex-Specific Diabetes-Related Hospitalization Rates by Complication North Carolina, 1988-89



Diabetes with Ketoacidosis (250.1)

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Diabetes with Renal Manifestations (250.4)

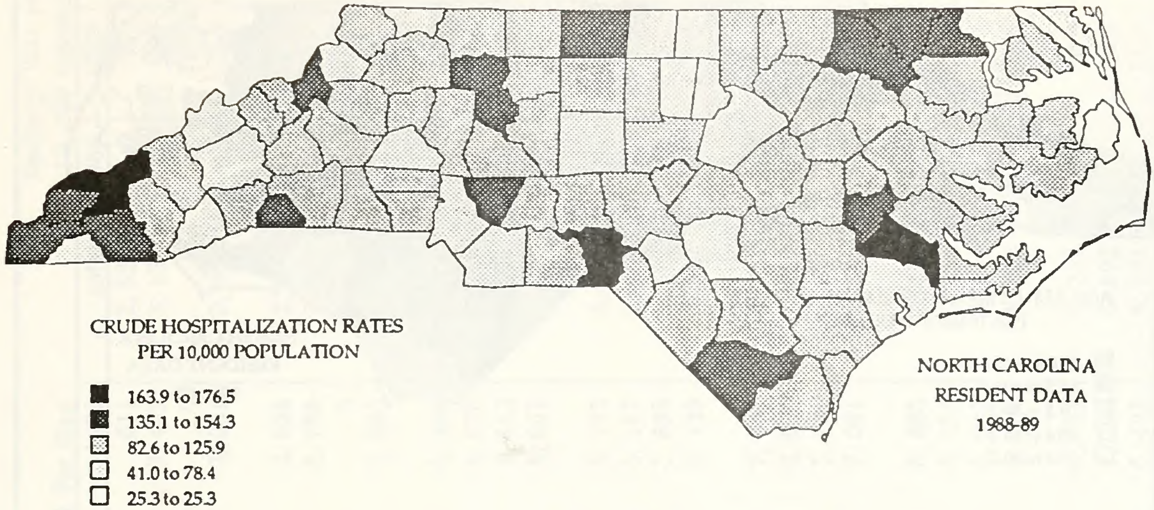
Diabetes with Ophthalmic Manifestations (250.5)

Diabetes with Neurological Manifestations (250.6)

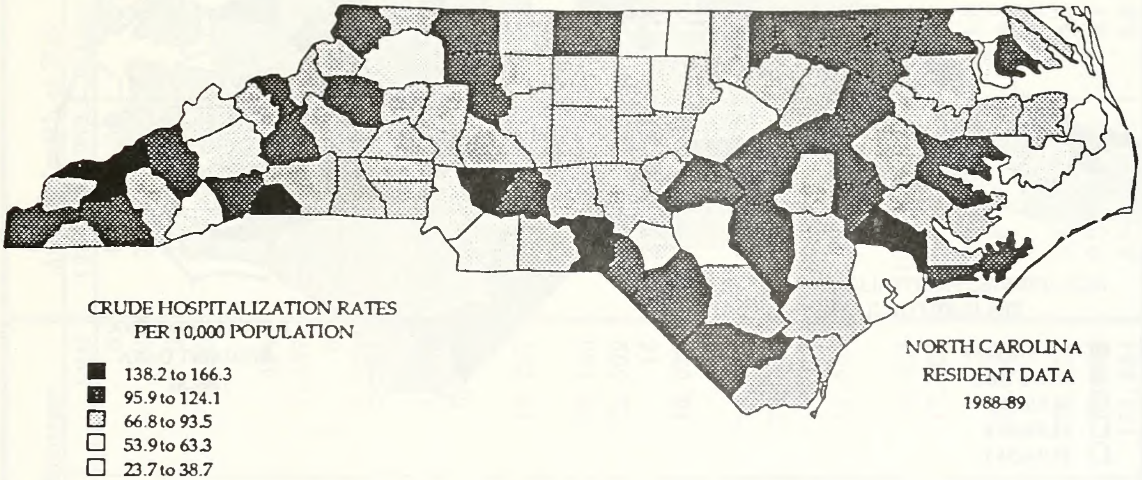
Diabetes with Peripheral Circulatory Disorders (250.7)

GURE 11.

DIABETES HOSPITALIZATIONS



DIABETES HOSPITALIZATIONS MALES



DIABETES HOSPITALIZATIONS FEMALES

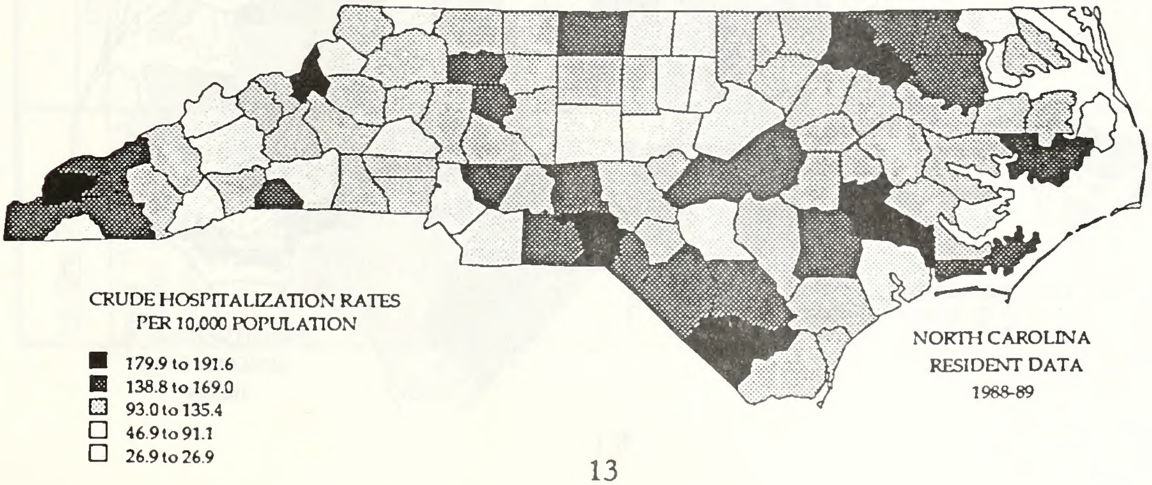
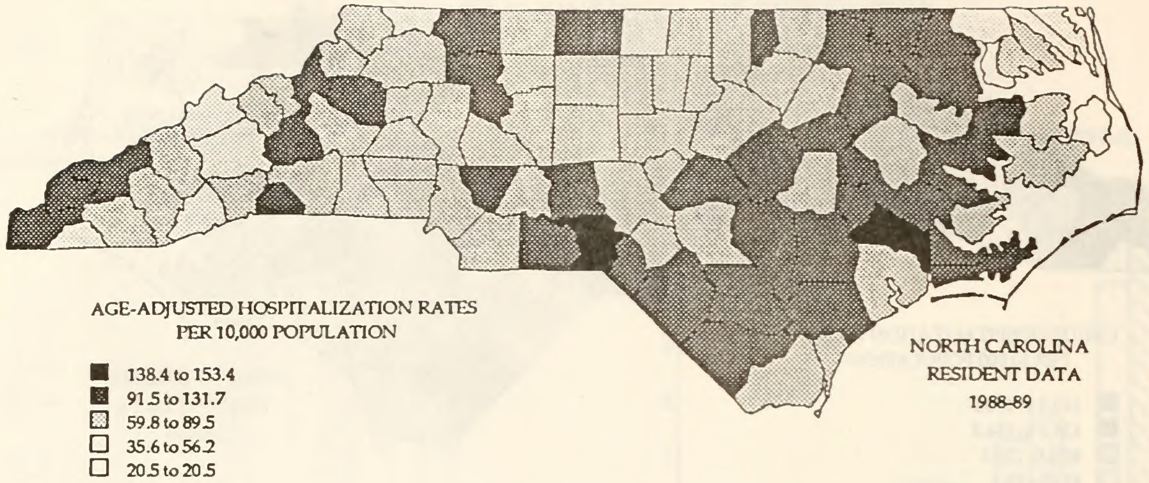
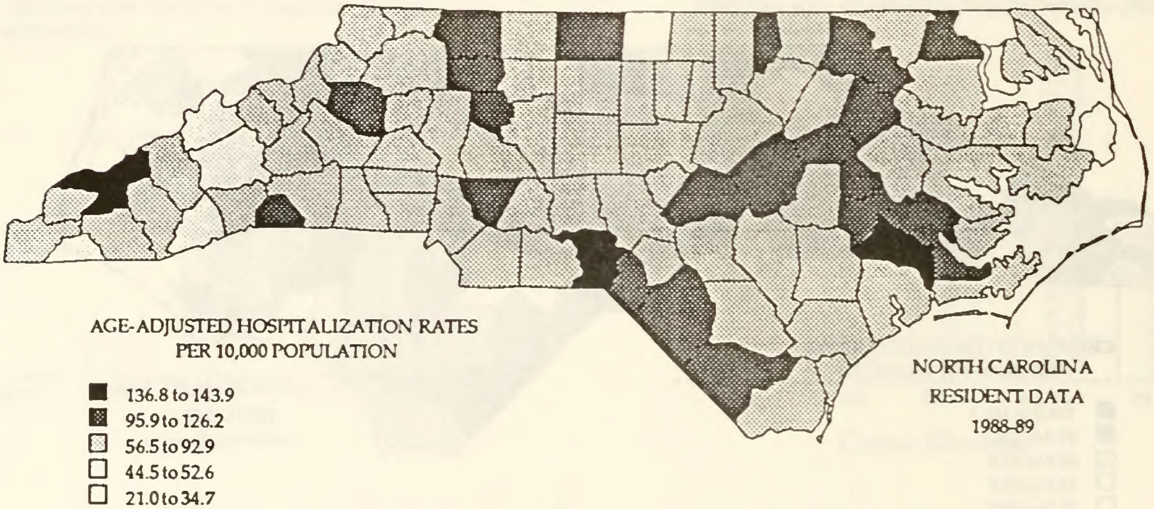


FIGURE 12.

DIABETES HOSPITALIZATIONS



DIABETES HOSPITALIZATIONS
MALES



DIABETES HOSPITALIZATIONS
FEMALES

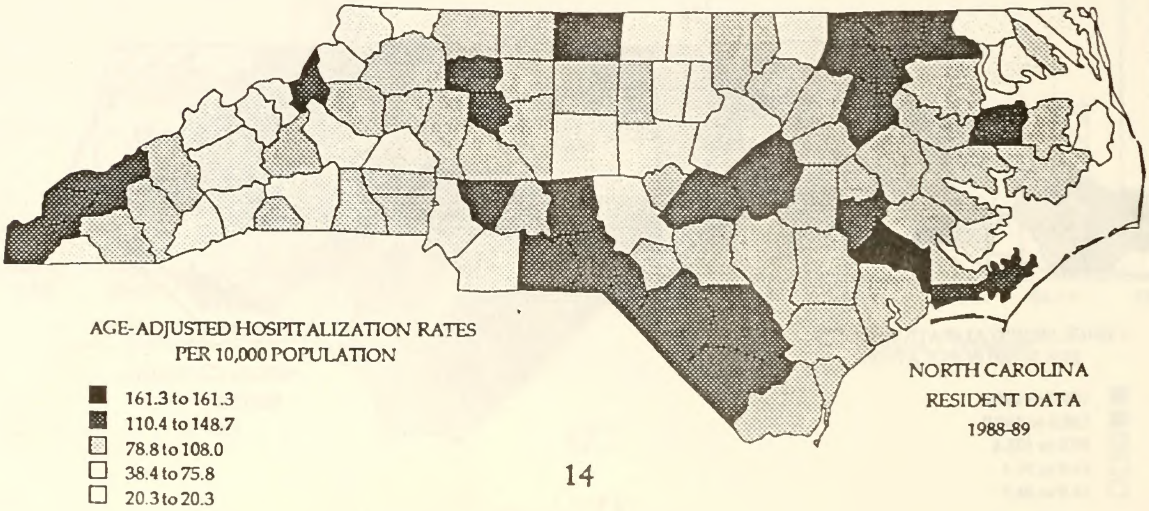


Table 1. Diabetes-Related Hospital Discharges (ICD-9 250)
North Carolina, 1988-89

Age/Sex-Group	Number of Discharges			Average Length of Stay			Average Cost Per Stay			Discharge Rate per 10, 000 population		
	1988	1989	total	1988	1989	total	1988	1989	total	1988	1989	total
males <1 yr	5	1	6	4.2	2.0	3.8	2, 869	811	2, 526	1.0	0.2	0.6
females <1 yr	9	5	14	7.8	5.8	7.1	2, 944	3, 475	3, 134	1.9	1.0	1.4
unknown <1 yr	0	0	0	0.0	0.0	0.0	0	0	0			
total	14	6	20	6.5	5.2	6.1	2, 918	3, 031	2, 951	1.4	0.6	1.0
males 1-19	445	489	934	5.4	5.4	5.4	2, 355	3, 536	2, 973	5.1	5.6	5.3
females 1-19	708	729	1, 437	5.6	4.8	5.2	2, 678	2, 780	2, 730	8.3	8.6	8.4
unknown 1-19	0	0	0	0.0	0.0	0.0	0	0	0			
total	1, 153	1, 218	2, 371	5.5	5.0	5.3	2, 553	3, 083	2, 826	6.7	7.0	6.8
males 20-39	2, 015	2, 213	4, 228	6.5	6.7	6.6	4, 181	5, 368	4, 802	18.5	20.2	19.3
females 20-39	2, 957	3, 067	6, 024	10.3	6.3	8.3	3, 812	4, 678	4, 253	27.3	28.1	27.7
unknown 20-39	1	4	5	4.0	15.8	13.4	14, 402	4, 613	6, 571			
total	4, 973	5, 284	10, 257	8.8	6.5	7.6	3, 963	4, 967	4, 481	22.9	24.2	23.5
males 40-64	10, 766	11, 334	22, 100	7.7	7.8	7.7	5, 699	6, 740	6, 233	133.9	137.7	135.8
females 40-64	12, 484	13, 425	25, 909	8.1	8.0	8.1	5, 240	6, 187	5, 731	138.7	146.1	142.4
unknown 40-64	0	16	16	0.0	27.4	27.4	0	3, 695	3, 695			
total	23, 250	24, 775	48, 025	7.9	7.9	7.9	5, 452	6, 439	5, 961	136.4	142.2	139.3
males 65-74	6, 812	7, 190	14, 002	8.9	8.8	8.9	6, 279	7, 337	6, 822	346.4	355.5	351.0
females 65-74	9, 889	10, 659	20, 548	9.5	9.6	9.5	6, 065	6, 929	6, 513	361.8	379.3	370.7
unknown 65-74	2	15	17	10.5	5.3	5.9	4, 367	5, 151	5, 059			
total	16, 703	17, 864	34, 567	9.2	9.3	9.3	6, 152	7, 091	6, 638	355.4	369.7	362.6
males 75+	4, 175	4, 676	8, 851	10.3	10.1	10.2	6, 055	6, 803	6, 450	401.4	438.2	420.0
females 75+	8, 444	9, 120	17, 564	10.7	10.7	10.7	5, 773	6, 655	6, 231	409.1	425.3	417.4
unknown 75+	0	9	9	0.0	4.6	4.6	0	5, 042	5, 042			
total	12, 619	13, 805	26, 424	10.6	10.5	10.5	5, 866	6, 704	6, 304	406.5	429.9	418.4
total males	24, 218	25, 903	50, 121	8.4	8.3	8.3	5, 735	6, 739	6, 254	77.5	82.0	79.8
total females	34, 491	37, 005	71, 496	9.3	8.9	9.1	5, 432	6, 324	5, 893	102.5	108.6	105.6
all	58, 712	62, 952	121, 664	8.9	8.7	8.8	5, 557	6, 493	6, 041	90.5	95.8	93.2

Table 2. Hospital Discharges with Primary Diagnosis of Diabetes (ICD-9 250)
North Carolina, 1988-89

Age/Sex-Group	Number of Discharges			Average Length of Stay			Average Cost of Stay			Disharge Rate per 10, 000 Population		
	1988	1989	total	1988	1989	total	1988	1989	total	1988	1989	total
males <1 yr	4	0	4	4.8	0.0	4.8	3, 016	0	3, 016	0.8	0.0	0.4
females <1 yr	4	1	5	6.0	6.0	6.0	1, 557	2, 076	1, 661	0.8	0.2	0.5
unknown <1 yr	0	0	0	0.0	0.0	0.0	0	0	0			
total	8	1	9	5.4	6.0	5.4	2, 286	2, 076	2, 263	0.8	0.1	0.5
males 1-19	342	386	728	4.3	4.4	4.4	1, 745	2, 246	2, 011	3.9	4.4	4.1
females 1-19	495	509	1, 004	4.6	4.3	4.4	2, 062	2, 247	2, 156	5.8	6.0	5.9
unknown 1-19	0	0	0	0.0	0.0	0.0	0	0	0			
total	837	895	1, 732	4.4	4.4	4.4	1, 933	2, 247	2, 095	4.8	5.2	5.0
males 20-39	868	926	1, 794	5.3	5.6	5.4	2, 969	4, 051	3, 527	8.0	8.4	8.2
females 20-39	1, 015	981	1, 996	6.1	5.7	5.9	3, 569	3, 827	3, 696	9.4	9.0	9.2
unknown 20-39	0	3	3	0.0	18.7	18.7	0	4, 437	4, 437			
total	1, 883	1, 910	3, 793	5.7	5.7	5.7	3, 292	3, 936	3, 617	8.7	8.7	8.7
males 40-64	1, 624	1, 679	3, 303	8.0	8.1	8.0	4, 371	5, 210	4, 798	20.2	20.4	20.3
females 40-64	2, 069	1, 965	4, 034	7.9	8.3	8.1	3, 955	4, 820	4, 376	23.0	21.4	22.2
unknown 40-64	0	4	4	0.0	3.3	3.3	0	1, 914	1, 914			
total	3, 693	3, 648	7, 341	7.9	8.2	8.1	4, 138	4, 996	4, 565	21.7	20.9	21.3
males 65-74	689	662	1, 351	10.4	11.0	10.7	5, 416	6, 971	6, 178	35.0	32.7	33.9
females 65-74	1, 017	1, 099	2, 116	10.7	9.7	10.2	5, 749	5, 303	5, 517	37.2	39.1	38.2
unknown 65-74	0	1	1	0.0	5.0	5.0	0	1, 179	1, 179			
total	1, 706	1, 762	3, 468	10.6	10.2	10.4	5, 614	5, 927	5, 773	36.3	36.5	36.4
males 75+	381	435	816	13.0	12.6	12.8	6, 419	6, 717	6, 578	36.6	40.8	38.7
females 75+	836	796	1, 632	11.6	12.0	11.8	5, 033	6, 383	5, 691	40.5	37.1	38.8
unknown 75+	0	0	0	0.0	0.0	0.0	0	0	0			
total	1, 217	1, 231	2, 448	12.1	12.2	12.1	5, 467	6, 501	5, 987	39.2	38.3	38.8
total males	3, 908	4, 088	7, 996	8.0	8.1	8.0	4, 213	5, 113	4, 673	12.5	12.9	12.7
total females	5, 436	5, 351	10, 787	8.4	8.3	8.3	4, 210	4, 724	4, 465	16.2	15.7	15.9
all	9, 344	9, 447	18, 791	8.2	8.2	8.2	4, 211	4, 891	4, 553	14.4	14.4	14.4

Table 3. Hospitalizations with Diabetes as a Mentioned Condition:
Total and Sex-Specific Crude and Age-Adjusted Rates Per 10, 000 Population
North Carolina, 1988-89

	Total		Males		Females	
County	Crude	Age-Adjusted	Crude	Age-Adjusted	Crude	Age-Adjusted
ALAMANCE	95.6	75.5	84.2	72.6	105.6	79.3
ALEXANDER	88.0	84.9	78.3	81.4	97.4	86.4
ALLEGHANY	78.2	56.2	76.3	64.0	80.0	46.8
ANSON	123.5	108.2	89.3	85.8	152.8	126.8
ASHE	114.7	80.9	111.3	91.2	118.0	70.2
AVERY	138.5	118.6	91.4	88.0	184.5	142.9
BEAUFORT	113.3	93.7	96.7	89.8	128.1	97.3
BERTIE	117.7	97.1	93.5	87.2	138.8	103.3
BLADEN	125.0	109.9	78.3	75.2	167.6	137.1
BRUNSWICK	94.1	81.9	89.2	82.4	98.7	81.0
BUNCOMBE	69.8	52.6	58.5	50.5	79.8	54.2
BURKE	88.2	76.7	80.9	80.4	95.1	73.2
CABARRUS	154.3	127.8	138.2	126.2	169.0	128.6
CALDWELL	113.6	100.8	105.2	102.6	121.5	99.1
CAMDEN	63.5	52.3	66.8	58.6	60.4	46.1
CARTERET	121.9	100.4	99.9	90.2	143.5	110.4
CASWELL	46.6	40.8	35.0	32.9	57.8	46.6
CATAWBA	71.3	63.9	68.0	67.4	74.4	62.1
CHATHAM	82.6	68.4	77.9	69.1	87.1	69.1
CHEROKEE	136.8	98.8	108.3	81.6	162.8	114.5
CHOWAN	72.9	54.5	55.4	44.5	87.7	61.5
CLAY	76.7	50.4	71.1	52.6	82.3	48.4
CLEVELAND	100.9	86.4	86.4	82.7	114.0	89.4
COLUMBUS	148.4	126.3	113.3	107.3	179.9	139.9
CRAVEN	95.4	102.4	79.1	100.3	112.3	106.1
CUMBERLAND	54.3	74.1	38.7	63.8	70.8	83.0
CURRITUCK	41.0	36.2	35.3	34.7	46.9	38.4
DARE	25.3	20.5	23.7	21.0	26.9	20.3
DAVIDSON	92.7	82.2	84.2	82.2	100.6	83.6
DAVIE	135.8	121.4	122.3	122.2	148.9	122.7
DUPLIN	113.8	95.0	82.4	77.9	142.0	108.0
DURHAM	75.1	72.0	67.7	72.4	81.4	72.1
EDGECOMBE	120.7	112.1	103.2	106.8	135.4	115.8
FORSYTH	102.7	89.1	90.2	87.9	113.7	90.7
FRANKLIN	103.6	84.7	78.7	73.2	126.1	94.4
GASTON	98.2	86.5	86.0	85.3	109.2	87.8
GATES	44.2	35.6	32.8	28.9	55.3	41.2
GRAHAM	135.3	106.2	82.9	71.2	186.9	136.4
GRANVILLE	96.3	80.1	84.9	80.2	107.4	79.6
GREENE	105.0	97.2	97.2	103.1	112.3	93.6
GUILFORD	93.4	82.3	85.4	83.6	100.5	81.9
HALIFAX	152.1	125.8	116.2	107.2	184.5	139.9
HARNETT	121.8	116.9	99.9	111.1	142.5	122.9
HENDERSON	104.0	68.9	95.9	71.5	111.4	66.5
HERTFORD	139.9	119.6	110.8	104.5	166.1	132.0
HOKE	75.3	81.5	53.9	64.3	95.1	95.1
HYDE	102.2	82.2	59.7	56.6	142.4	101.1
IREDELL	97.3	82.2	82.8	76.6	110.7	88.9
JACKSON	87.1	77.7	71.1	70.6	101.8	82.1
JOHNSTON	123.7	106.4	99.7	96.4	145.7	115.4
JONES	176.5	153.4	158.5	143.9	191.6	161.3
LEE	98.1	88.4	74.8	75.0	119.0	99.5
LENOIR	150.1	129.5	111.0	107.2	184.3	148.7
LINCOLN	93.6	86.0	82.8	82.6	103.8	89.4

Table 3. continued

County	Total Crude	 Age-Adjusted	Males Crude	 Age-Adjusted	Females Crude	 Age-Adjusted
MCDOWELL	114.7	93.6	96.6	88.4	131.7	97.9
MACON	135.7	86.1	116.2	74.9	153.6	97.6
MADISON	61.6	49.7	55.2	49.5	67.8	48.7
MARTIN	102.9	88.0	80.5	75.3	122.5	98.9
MECKLENBURG	65.6	63.5	61.0	66.2	69.8	62.0
MITCHELL	103.4	73.5	96.1	77.3	110.2	72.9
MONTGOMERY	116.6	100.5	86.9	83.6	144.9	115.4
MOORE	93.6	69.6	84.8	67.6	101.6	72.2
NASH	91.5	81.5	76.8	76.0	104.5	85.6
NEW HANOVER	91.5	83.9	80.0	82.7	101.9	85.1
NORTHAMPTON	135.9	109.9	102.7	92.9	167.6	124.1
ONSLOW	53.3	85.0	35.8	75.1	77.7	94.8
ORANGE	53.6	59.8	54.7	65.9	52.5	55.4
PAMLICO	88.0	68.5	91.9	76.1	84.5	61.6
PASQUOTANK	93.5	83.1	77.2	76.0	108.3	89.6
PENDER	109.0	91.5	88.4	81.5	128.3	99.5
PERQUIMANS	100.4	76.6	108.8	86.4	93.0	69.2
PERSON	75.4	63.6	60.5	56.5	89.0	68.8
PITT	84.3	88.6	73.4	87.2	93.8	91.3
POLK	144.1	91.8	141.4	103.7	146.6	79.9
RANDOLPH	78.4	68.9	73.3	70.2	83.1	67.8
RICHMOND	164.7	138.4	146.7	136.8	181.1	140.0
ROBESON	121.9	121.3	98.1	107.9	142.9	132.2
ROCKINGHAM	141.5	118.1	124.1	117.3	157.5	120.1
ROWAN	103.0	80.2	82.0	70.2	122.3	88.5
RUTHERFORD	83.4	66.1	74.9	66.6	91.1	64.9
SAMPSON	116.6	97.6	95.9	89.9	135.4	103.2
SCOTLAND	125.9	123.8	110.5	122.7	139.8	127.3
STANLY	109.5	86.5	101.1	88.8	117.1	85.7
STOKES	91.6	87.1	79.5	84.1	103.0	90.3
SURRY	120.3	96.2	115.3	104.4	125.0	87.4
SWAIN	163.9	131.7	166.3	143.1	161.7	124.0
TRANSYLVANIA	60.0	46.1	54.0	45.0	65.6	47.5
TYRRELL	102.5	81.4	75.0	62.7	126.6	97.7
UNION	66.3	66.2	63.3	69.3	69.0	63.7
VANCE	114.2	101.3	99.6	98.8	127.2	103.1
WAKE	65.0	69.2	56.9	69.8	72.8	70.2
WARREN	103.5	80.1	99.7	85.3	106.9	75.8
WASHINGTON	111.9	102.1	89.1	89.4	132.6	112.1
WATAUGA	72.6	72.3	66.8	74.3	78.2	69.3
WAYNE	91.8	89.5	73.0	80.5	109.2	97.2
WILKES	85.3	74.9	61.4	59.7	108.1	87.1
WILSON	114.3	103.7	106.2	108.3	121.4	101.0
YADKIN	135.1	107.4	110.9	95.9	158.3	119.4
YANCEY	85.9	62.7	71.0	58.0	99.9	66.3
STATE TOTAL	93.1	83.7	79.8	80.3	105.6	86.8

Rates were age-adjusted using the 1980 North Carolina population as the standard.

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